

Production Technology of Jute

English name: Jute.

Family: Tiliaceae.

Species

1. *Corchorus capsularis* (White jute).
2. *Corchorus olitorius* (Tossa jute).

Origin: Indian Subcontinent.

Distribution

Jute is an important industrial crop in Bangladesh. Bangladesh ranks second among the jute growing countries. Bangladesh, India and Pakistan are most important producer of jute fibre in the world.

Economic Importance

It is grown primarily for its fibre which has large commercial importance in the world. Fine quality fibre is used for the manufactures of different value added products such as household, textiles, industrial textiles, reinforced plastics, handicrafts, paper, pulp, geo textiles etc. It has been proved that fabrics from jute fibre of all design and pattern could be woven of automatic loom and the products would be smooth as those made of cotton. These products are emerging as major foreign exchange earner.

Variety

Two cultivated species namely White (*Corchorus capsularis* L.) and Tossa (*Corchorus olitorius* L.) jute are grown in Bangladesh.

White jute:

- CC-45, CVE-3, C-6 (Early variety).
- CVL-1, D-154, BJC-83, BJC-8370 (Late variety).

Tossa jute: 0-9897, BJRI Tossa pat- 4, BJRI Tossa pat-5 etc.

BINA variety: Atom pat-38, BINA deshi pat- 2, BINA patshak-1.

Climate

Jute requires a warm and humid climate with temperature fluctuating between 24⁰ C and 37⁰ C. The permissible relative humidity favorable to growth ranges between 70-90 % . Rainfall is one of the most important factors for growing jute and the ranges from 250-270 mm are essential requisite for good growth and yield of jute.

Soil

Jute is widely grown in sandy loams, clay loams with varying soil management practices. Sandy soils and heavy clay soil are unsuitable for jute production. Soil with a low pH give a poor crop. The optimum pH is around 6.4. High and medium high land where rain and flood water does not stand is suitable for tossa jute cultivation. In the seedling stage water logging is not tolerated by both species.

Land Preparation

5-6 deep ploughing and cross ploughing followed by laddering with clod free fine tilth condition. Soil moisture 21-45 % is ideal for germination.

Seed Rate (According BARC)

A. Broadcast method-

- *C. capsularis* (white): 7 – 8 kg/ha.
- *C. olitorius* (tossa): 5 – 6 kg/ha.

B. Line sowing method-

- *C. capsularis* (white): 5 – 6 kg/ha.
- *C. olitorius* (tossa): 3 – 4 kg/ha.

Seed Treatment

Seed treatment with Vitavax-200 (0.4%) i.e. for 1 kg of seed with 4 gm Vitavax-200 or Provax-200 (0.4%) before sowing of seeds or preservation of seed is very useful to control all fungal seed borne diseases of jute.

Time of sowing

- White jute: Late February – April.
- Tossa jute: 15 March – April.
- For seed production, the suitable time of seed sowing/ cutting is mid July – last week of August.
- Sowing time varies 15-30 days from North to South.

Sowing methods

The traditional method of sowing of jute by broadcasting. For even distribution of seeds it is mixed with loose soil because the seeds are very small. For still better result, it is advisable to broadcast the seeds cross wise. Line sowing also done.

Spacing

- Line-Line: 30 cm (*Capsularis*), 27 cm (*Olitorius*).
- Plant to plant: 5-7 cm (both).

Fertilizer Application

Fertilizer (Kg/ha)	<i>C. capsularis</i>	<i>C. olitorius</i>
Urea	80-100	20-60
TSP	40-50	15-30
MoP	60-80	22-50
MgSO ₄	22-40	22-40

1/2 Urea, Total TSP, MoP and MgSO₄ should be applied during final land preparation. The rest 1/2 Urea should be applied at 42-50 DAS when the plant height 10-12 cm.

Intercultural Operation

Weeding, Thinning and Mulching: Weeding is one operation which can increase crop yield. Efficient weeding saves moisture, crop nutrients and to some extent air and light required for the cultivated crop. Intercultural operations are as follows:

- First weeding, mulching and simultaneous thinning should be done after 10-15 days of sowing (DAS).
- Second weeding, mulching and simultaneous thinning may be operated after 25-30 DAS.
- Third weeding, mulching and simultaneous final thinning and top dressing of urea fertilizer followed by hoeing may be operated after 40-50 DAS.
- The jute field should be kept clean to avoid infestation from insects and pests. So pest management care should be necessary.
- Excess water should not be allowed to stand in the plot at growing stages.

Irrigation

Jute is a rainy season crop. There is no need for irrigation. If moisture is not sufficient enough in the field after sowing of seeds or before sowing of seeds, light irrigation is given for proper germination. Later on this crop is irrigated when the plants are 10 to 12 cm tall and 3-4 leaves are formed. Supplemental irrigation may be given to the crop according to requirement of the crop. The field should not be irrigated too much but care should be taken that the field does not become dry and compact and the root development is hampered.

Insect Pest and Disease

Insect Pest: Jute hairy caterpillar, Jute Semilooper, Jute apion, Jute red mite, Jute white mite, Field

cricket, Cutworm, Black hairy caterpillar are important insect pest of jute field.

Control

- To control Spraying with Diazinon 60 EC for Jute hairy caterpillar, Jute Semilooper, Jute apion.
- Apply Heptachlor for Field cricket, Cutworm.
- Spray the infested fields using recommended miticide like Kelthan 42% EC or Torque 55% WSC or Nerot 50% EC for Jute red mite, Jute white mite.

Disease: Stem rot, anthracnose, Black band, Seedling blight and rot are major disease of jute.

Control

- Burn the crop debris.
- Spray Dithane M-45 @ 18.56 g/10 litres water.

Harvesting

Time: *Capsularis*: July – August.

Olitorius: August – September.

Maturity Symptoms: Quality of jute fibre has direct relationship with stage of harvest. Early harvesting gives finer fibre of a good quality where late harvesting gives a large yield but a coarser fibre.

1. Few days before flowering.
2. It could be harvested between 110 – 120 days.

Method: The plant generally cut with sickle close to the ground level by hand. Bundle should be made after grading of jute plant as small, big, thin, thick. Leave the bundle in the field for 2-3 days to allow the leaves to shed then ret. The colour of the fibre is darkened if the leaves are allowed to stick to the plant during retting.

Retting of fibre

Retting is a biological process by which the best fibre gets loosened for an easy separation from the woody stalk. During this process the gums, pectines and other mucilaginous substances are removed by a combined action of water and microorganisms.

A number of methods have been developed and recommended for the improvement of fibre quality through retting. For retting gently flowing, fairly deep, clear and soft water is ideal. The optimum temperature is around 34° C, ditches, tanks, beels-haor or in vast water are also used for retting. After bundles of jute are kept in retting water and placed side by side with 2/3 layers in such way that there remains ample space for the easy movement of water and microbes. Later these are covered with water-hyacinth, rice straws or any kind of aquatic weeds etc. The float/ jack is then weighed down

with concrete blocks or are kept submerged (at least 10 cm below the surface water) with bamboo crating. Earth chunk, logs of banana, mango tree or any other green logs as covering or weighing materials should be avoided as they convert the fibre colour dark (shamla). In that case polythene-wrapped earth chunks can be used safely as it protects the plants to come in contact with clay.

For accelerating the retting speed and improving the fibre colour, about 1 kg of urea may be applied in 1000 kg of green jute plants. The urea may be added either in a water solution or sprinkled directly in the layers of the jute bundle in jute jaks. Retting is a microbiological process and, therefore, the end-point is determined by inspecting a few plants each day from the tenth day onward. If fibre slips out easily from the wood on pressure from the thumb and fingers, retting is considered complete. After that the jaks should be taken out and extraction of fibre must be completed as soon as possible. Because any delay results in a poor quality of fibre.

Fibre Extraction

The fibres can be extracted from the retted plants in two ways –

- (1) By taking one or two plants at a time sitting on the dry land.
- (2) By standing in knee-deep water and using a bamboo frame, a bunch of plants is taken out of the jak and the fibres are extracted from the whole bunch at a time by breaking the jute sticks at about 45 cm from the bottom.

In either of the two ways, if the bottom parts of the retted plants are scraped off by hand prior to extraction or beaten with a wooden beater the amount of cuttings are reduced significantly. Better fibres are obtained if extraction of fibres is done on the ground taking single or two plants at a time. After extraction, the fibres are washed thoroughly in clean water so that broken jute sticks, cuticular layer of barks, clay or any other dirt gets free from fibres.

Removal of Shamla Colour (Dark Colour)

The shamla fibre (if produced due to improper practices) could be converted to bright and normal fibre if they are immersed in 2.5% Tamarind water solution or Acid mixture (0.25% sulphuric acid, 0.25% hydrochloric acid and 0.6% oxalic acid). But the treated fibres should be well washed in clean water so that no trace of Tamarind or acid solution is left in the fibres. Otherwise fibre quality deteriorates at storage.

Ribboning and Ribbon Retting

Through this technique ribbons (bark of plants) can be very easily separated out from the woody core in green stage (just after harvest). Before retting, ribbons should be arranged into ring form. If retting water is not available in the nearby places, ribbons may be retted in big earthen vats, filled with clear water. One may ret 30 kg of ribbons in one of such big earthen vats. If shallow small pond/ditches or canals are available in the nearby places, the ribbons may be retted by putting the ring of ribbon in a bamboo pole and steeping under water tying with two bamboo poles fixed in the bottom of the pool. Retting may be conducted in artificially made small ditches dug around homestead of the farmers or

in jute field covering the ditches with polythene sheets. The ditches may be filled with clear water from tube well or from any other water sources.

Advantages of Ribbon Retting

- Lesser amount of water is required for retting.
- The quality of fibre improves.
- The jute sticks remain stronger since it is not retted.
- Minimum transportation cost is involved.
- Cutting free better quality fibre fetches better price.

Drying of Fibres

After washing, the fibre should be dried well in a bamboo frame or by hanging in any way, so that it does not come in contact with mud or dust. Fibers should not be dried spreading on the ground. Mud or dust not only lowers the quality of the fibre but also creates health hazards to jute mill workers.

Yield

- Average: 13 Quintal/ha.
- Maximum: 40 Quintal/ha.

Seed Production

- *capsularis*: 4-5 Quintal/ha.
- *Olitorius*: 2-3 Quintal/ ha.

Production Technology of Cotton

English name: Cotton.

Family: Malvaceae.

Species

1. The American cotton:

a) *Gossypium hirsutum* (Middle America or Mexico).

b) *Gossypium herbaceum* (Africa).

2. Deshi cotton:

a) *Gossypium arboreum* (South east Asia).

b) *Gossypium barbadense* (Egypt).

Origin

Pakistan.

Distribution

Cotton is the most important vegetable cultivated in about 60 countries in the world. Russia, USA, Mexico, Sudan, Egypt, China, Pakistan, India, Indonesia, Turkey, Brazil etc account for about 85 % of the total cotton production.

Importance

Cotton is one of the important cash crops in Bangladesh. It is the main raw materials of textile industry. Raw cotton is also used for medical and surgical purposes. The linters are used as filling materials for making cushions.

Variety

DEF 1, D 4, D 10, D 124, Deltapine 1, Rupali, Ava, Rangunia, Chakoria etc.

Main varieties of American cotton grown in Bangladesh are CB-1 (Deltapine-90), CB-3 (Deltapine-50), CB-5 (a cross between Deltapine and indigenous variety), CB-9 (Developed from SI/91/646) and CB-10 (developed from BC-0397).

Climate

- Cotton is a crop of subtropical climate.
- Cotton needs on an average a minimum temperature of 60° F for germination.

- 70 -80⁰ F for vegetative growth.
- 80-90⁰ F with cool nights during fruiting period.
- 70-80 cm rainfall is enough for cotton cultivation.
- An annual rainfall of at least 50 cm is minimum requirement for cotton unless it is grown on irrigated soils.

Ultimately rains and the heavy humid weather during later stages of cotton season may spoil the produce, lower its ginning properties or promote attack of insect, pest, diseases. So weather should be clear at harvesting because rain at this stage will discolour the lint and reduce its quality.

Soil

Cotton needs any type of soil but with a excellent water holding capacity and aeration and good drainage as it cannot withstand excessive moisture and water logging. The major group of soil for cotton cultivation are the alluvial soils, loam, black soils, red sand loam. pH 5-8.5 is the best for cotton cultivation. Alkaline and saline soil is not good for cotton cultivation.

Land preparation

For cotton cultivation deep ploughing is essential because cotton is a deep rooted crops. The soil should be loose and friable. 3-4 ploughing followed by cross ploughing and laddering are essential to bring the soil to a good tilt for cotton cultivation. The land should be well leveled and weed free.

Seed rate

Depending upon the variety, soil type, the cultivation on practices and method of sowing, seed rates and spacing have been recommended.

- Bangladesh: Average- 15 kg/ha.
- Indian cotton: 12-15 kg/ha.
- American cotton: 15-20 kg/ha.

Spacing

- Indian cotton: 45-50 cm X 50-60 cm.
- American cotton: 50-60 cm X 60-90 cm.

Depth of sowing: 4-5 cm.

Time of sowing

- **Kharif:** April – May / May – June (Never later than 15 July).
- **Rabi:** August – September / Late September – October.

Seed treatment

The seed of most of the cotton varieties, particularly the American type is covered by short fibre called fuzz. The fuzz cling with seed together. Thus creating a problem in free rolling and separation of individual seed for sowing.

Non-chemical: In this case the seeds are soaked in water for 10-12 hours and then they are rubbed with fresh cowdung, wood ash or soil dust. After rubbing the seed is spread in the shade for few hours. When they are dried they can be used for sowing.

Chemical: The seeds are soaked in strong commercial Sulphuric acid (H_2SO_4) for 2 minutes. Then the seeds taken out washed in running water to remove the chemical. The seeds are also immersed in the solution of ZnCl_2 for 10-12 minutes and then washed. This chemical dissolve the fuzz (disturbing materials). Seeds are treated only for removing fuzz but also for removal of boll worm, different pests and enhance germination.

Fertilizer Application

Fertilizer	Quantity (ha)
Organic matter	5-8 ton
Urea	112-148 kg
TSP	100 kg
MoP	100-132 kg
Sulphur	19-24 kg
Zinc	4-6 kg

Intercultural operation

Weeding: Weed reduce crop yield seriously. In rabi season 3-4 and in kharif season 2-3 weeding and thinning is necessary. Hoeing the crop more frequently. Some weedicide such as TOK-E-25, Ansar-521, Basalin 46 EC be applied for controlling weed. The critical period for weed competition in cotton ranges from sowing to 60 DAE. So cotton field should be kept weed free at least up to 60 DAE.

Thinning: It is done twice , firstly within 10 DAE keeping two seedling per hill and secondly within 20 DAE keeping single seedling per hill.

Gap filling stage: Gap filling should be done by re-sowing.

Topping: It is desirable to remove the top growing point (topping) once from each plant at a height of 1-1.2 m or between 80-90 days of crop growth. The practice further terminal growth encourage sympodial branching of boll development. It also facilitates spraying operations and picking of cotton.

Irrigation and drainage

Flowering and boll formation are the critical stages from the point of irrigation. Inadequate irrigation stages during this stages leads to a heavy shedding of flower buds and bolls. In rabi season (in case of abnormal drought condition) 2-3 irrigation is needed. First at 40 DAS (before blooming) and Second at 55 DAS (after flowering). In kharif season, no need to irrigation.

Cotton during its early stage of growth is very sensitive to water stagnation for long period. Therefore, drain away excess water of rain or irrigation. The crop cannot tolerate water logging condition at any stage of growth.

Diseases and pests

Major insect of cotton are Pink boll worm, spotted boll worm, cotton leaf roller, aphid etc.

- Cotton aphids are controlled by spraying Malathion 0.08 %.
- Cotton leaf roller, spotted boll corn, pink boll corn are controlled by dusting crop with 10 % carbonyl.
- Red cotton bug and dusky cotton bug are controlled by dusting 5 % B.H.C.

Important disease of cotton are Wilt, Anthracnose, Leaf blight, boll rot etc.

- Seed should be treated with AGROSAN-GN/ GRANOSAN-M.
- Spray the crop with Cupper fungicide.

Harvesting

Cotton is an important crop. It is harvested by picking fully opened boll by hand in 3-4 pickings at 25-30 days interval. Picking is done when bolls burst fully. Bolls start bursting after 110-120 days of sowing. The season of harvesting varies with of sowing, duration of variety. Well dried bolls are picked.

Maturity symptoms

- Picking should be done when boll begin to fully burst.
- Boll setting on the stem are in an angle of 45° with stem.
- The growth and development of the plant is stopped.
- The plant become yellow.
- Flower turn to purple color.

Picking time

- Rabi season: February – March / March – April.
- Kharif season: October – December.

GOT (Ginning Out Turn)

Ginning is a process of delinting the commercially used lint from seed. Seed cotton composed of 2/3 seed and 1/3 lint. This ratio (2:1) is known as GOT. Yield increased with the increased of GOT.

Post harvest operation

To maintain the quality of fiber for textile industry and good quality seed for oil extraction , care should be taken to handle the picked cotton. Kapas picked from open bolls should not be contaminated with dried leaves and other foreign matter.

Yield

- Rabi season: 1000-1500 kg/ha.
- Kharif season: 800-1000 kg/ha.